A NEEDS ASSESMENT OF RISK CONTROL SERVICES FOR ROTTERDAM INTERNATIONAL SAFETY CENTER, THE NETHERLANDS

by

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ABSTRACT

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A NEEDS ASSESMENT OF RISK CONTROL SERVICES FOR ROTTERDAM INTERNATONAL SAFETY CENTER, THE NETHERLANDS
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The purpose of this study was to determine major loss exposures, control technologies, and future risk control expectations of Rotterdam International Safety Center's (RISC) target market clients in Belgium and The Netherlands.

The objectives of this study were to (1) establish a knowledge base of target market loss exposures, (2) identify Risk Control technologies used to reduce or eliminated target market accidental losses and (3) identify target market Risk Control expectations as it pertains to the development of control technologies.

RISC offers two basic types of services: Fire fighting and emergency response training. The markets for these services in Belgium and The Netherlands are relatively stable as far as corporate growth is concerned. Because of this, the only way for RISC to accomplish growth is by capturing greater market share. RISC could gain a significant advantage by combining its already successful training programs with integrated Risk Control services.

A literature review was conducted in order to analyze past and current Risk Control trends. The study also included interviews of Safety and Health/Risk Control professionals from six high-risk organizations in Belgium and The Netherlands. The interviews and literature review established a common trend among these organizations. Production downtime due to technical and operational errors was the leading loss exposure overall. Engineering controls such as Job/Process Hazard Analysis and Process Safety Management were the leading technologies used to control these losses. Future expectations for the control of production downtime centered on the development and implementation of management technologies such as Risk Management Information Systems.

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Chapter I

STATEMENT OF THE PROBLEM

Rotterdam International Safety Center (RISC) is a professional organization which operates worldwide in the development, implementation and monitoring of total fire protection concepts for industry, commerce and the public sector. The emphasis is on prevention, preparation (training) and control. RISC's leading market position is based on its comprehensive knowledge of protection and experience in fighting fires.

RISC's main training facility, RISC Fire & Safety Training, and headquarters are located in Rotterdam's Europort. The port gives direct access to the North Sea and is directly linked to the commercially vital Rhine and Maas rivers. It is also currently the largest port in the world. This strategic location gives RISC direct access to major petrochemical, shipbuilding, and other client industries.

Along with theoretical physical and chemical fire courses, RISC also provides realistic training simulating both on- and offshore scenarios.

The instructors and lecturers provide training, refresher courses and practical instruction that are custom made to individual organizational needs. The training covers a wide range of topics including but not limited to control of indoor fires, offshore survival, hazardous materials management, and disaster control. Currently, RISC is investigating new ways of improving and increasing its' services for current and future clients in Belgium and The Netherlands.

This year, 1999, RISC is contemplating adding a major set of client service for its target market clients in Belgium, and The Netherlands. The thrust is providing Risk Control services in addition to emergency response and fire training. Risk Control services provide methods of reducing the frequency and/or severity of losses including exposure avoidance, loss prevention, loss reduction, segregation and combination of exposure units and non-insurance transfer of risk (Risk Management Glossary, 1989). Several challenges exist that need to be clarified prior to implementation plans. Essentially, RISC has limited Risk Control expertise and has little knowledge of client loss exposures, control technologies, and future expectations in Risk Control.

Purpose of the Study

The purpose of the study is to determine major loss exposures, control technologies, and future risk control expectations of RISC's target market clients in Belgium and The Netherlands.

Objectives

The objectives of this study are:

1. Establish a knowledge base of target market loss exposures.
2. Identify Risk Control technologies used to reduce or eliminate target market accidental losses.
3. Correlate target market Risk Control expectations pertaining to the development of control technologies.

Background and Significance

RISC offers two basic types of services: Fire fighting and emergency response training. The markets for these services in Belgium, and The Netherlands are relatively stable as far as corporate growth is concerned. Because of this, the only way for RISC to accomplish growth is by capturing greater market share. RISC could gain a significant advantage by combining its already successful training programs with integrated Risk Control services. This combination would make RISC the largest provider of both fire and Risk Control services in this market.

However, a knowledge base of client Risk Control requirements is needed in order to develop implementation plans.

This study will establish basic knowledge of loss exposures experienced by industries in the target market. Each area of loss exposure requires industry to spend valuable company resources to develop and implement Risk Control technologies aimed at eliminating or reducing financial loss. RISC can use this information to focus further investigation into the development of possible Risk Control services aimed at providing practical and cost-effective loss exposure solutions to the target market.

Insight into Risk Control technologies being used and to what extent they are being implemented in the target market will also be provided by this study. Finally, this study will also provide a vision into future target market Risk Control expectations as it relates to the implementation of control technologies.

Limitations of the Study

The following limitations are noted related to this study:

1. This study is limited to information provided by the 6 selected high-risk target market industries and their selected representatives in Belgium, and The Netherlands.

2. The validity of loss exposure data collected is dependent on the effectiveness of each selected organization's management information system.
3. The representative of each current or potential client that participated in this study was identified by RISC as the person responsible for Risk Control activities.
4. The regional managers responsible for client services in Belgium and The Netherlands identified potential and current clients to take place in this study.
5. Results of this study cannot be generalized to groups outside of the 6 organizations that participated in this study.

Definition of Terms

The following definitions are some key terms that will be used in this study. Some terms are unique to Risk Control. Along with definitions of terms are acronyms that will be referred to throughout the study.

Accident: Unplanned injurious or damaging event, which interrupts the normal progress of an activity. An accident may be seen as resulting from a failure to identify a hazard or from some inadequacy in an existing system of hazard controls.

BENELUX: The countries of Belgium, The Netherlands and Luxembourg.

Exposure: Possibility of loss.

Failure Mode and Effect Analysis (FMEA): This method is used to correlate each system or unit of equipment with (1) its potential failure modes, (2) the effect of each potential failure on the system or unit, and (3) how critical each failure could be to the integrity of the system. The failure modes and the effects are then ranked according to criticality to determine which ones are most likely to occur and possibly cause assures incident.

Fault Tree Analysis (FTA) and Event Tree Analysis: Both methods are formal deductive techniques used to estimate the quantitative likelihood of event occurring. Fault tree analysis works backward from a defined incident to identify and display the combination of operational errors and/or equipment failures involved in the incident. Event tree analysis works forward from specific events, or sequences of events, to pinpoint those that could result in hazards and to calculate the likelihood of an event occurring.

Hazard: Condition or activity, which increases the probable frequency or severity of loss.

Hazard and Operability (HAZOP) study: The HAZOP study method is commonly used in the chemical and petroleum industries. HAZOP requires a multidisciplinary team, guided by an experienced leader. The team uses specific guide works (such as "no," "increase," "decrease," "reverse,") that are systematically applied to identify the consequences of deviations from design intent for various processes and operations.

Moral hazard: Hazard arising from personal, as distinguished from physical, characteristics, such as the habits, methods of management, financial standing, mental condition, or lack of integrity of an insured who may intentionally cause, or hope for, a loss.

Physical hazard: Hazard arising from physical characteristics of animate or inanimate objects.

Risk: 1. Possibility of loss or exposure to loss. 2. Probability or chance of loss. 3. Peril which may cause loss. 4. Hazard, or condition which increases the likely frequency or severity of loss. 5. Property or person exposed to loss. 6. Potential dollar amount of loss. 7. Variations in actual losses. 8. Probability that actual losses will vary from expected losses. 9. Psychological uncertainty concerning loss.

Risk Control: All methods of reducing the frequency and/or severity of losses including exposure avoidance, separation, combination, loss prevention, loss reduction, segregation of exposure units and non-insurance transfer of risk. The term focuses on economic measures, broad areas of risk, and is management oriented yet employee inclusive.

What If?: This method works by asking a series of questions to review potential hazard scenarios and possible consequences. A good method to use when analyzing proposed changes to materials, processes equipment, or facilities.

Chapter II
LITERATURE REVIEW

Introduction

The purpose of this literature review was to examine available information regarding the current regulatory need for risk control services in Europe and to provide a broad perspective of the development and evolution of risk control services. This review evaluated process exposures, control technologies, and successful comprehensive management systems.

References included professional journals, company web sites, governmental web sites, and related texts. Risk control professionals were also personally interviewed as part of the research.

Historically, the primary functions of an accident prevention department in Europe were to prevent those losses that could be prevented and to minimize those that could not be prevented.

Today, prevention has evolved into risk control and now encompasses many more activities than simply inspecting and tending to compliance issues. Today's business world has many more increasingly complex loss exposures. The increasing complexity of health and safety problems stemming from industrial practices in Europe calls for specialists who are able to recognize and control inherent risks of industrial processes (Burdorf, 1994).

Regulatory Need for Risk Control Services in Europe

The Framework Directive

On 12 June 1989, the European Community Framework Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work was introduced. The Framework Directive establishes the general rules for the protection of the health and safety of workers at the workplace which employers are required to observe. The Directive also sets out the obligations and responsibilities of workers.

The framework Directive covers all workers in the European Community, privately as well as publicly employed, with the exception of the self-employed and domestic servants. The intent of the directive is to provide a safe and healthy working environment and ensure equal protection for all workers throughout the fifteen Member States.

Before the adoption of the framework Directive, Member States had to comply with specific directives on various exposures such as excessive noise, toxic chemicals and asbestos. However, implementation of the framework Directive requires a “holistic” approach to health and safety and requires changes in national policies within Member States. As an example, it has been an innovation to many Member States that requirements must be followed to protect workers in the public sector (European Commission, 1999).

Required Preventive Services in Europe

The need for safety and health/risk control services within the European Community is expressed within the Framework Directive and national policies. These services are required by law and have a minimum objective of the protection and prevention of occupational risks.

European Union: Framework Directive 89/391, Article 7, requires employers to designate one or more workers to carry out activities related to protection and prevention of occupational risks, or enlist competent external services to carry out these tasks (Walters, 1998).

Belgium: Under the General Regulations for the Protection of Labour (RGPT Book II, Chapter III) provisions laid down by Royal Decrees in 1965 and 1976, all contracted workers should have access to an occupational health service. The employer may use an internal or external service. The costs of the service are borne by the employer (DeBroeck, 1995).

The Netherlands: The working Conditions Act 1980, amended in January 1994 to incorporate the requirements of the Framework Directive 89/391, obliges all Dutch employers to use a certified occupational health service for a variety of basic services. The employer may decide in consultation with the works council or workers whether to use an internal or external service. The certified service is a preventive, integrated one with a specific “minimum package” of prevention/protection tasks identified in the legislation. Small firms with less than 16 workers may be exempted from these requirements (Smulders, 1995).

Summary of Opportunities: The Framework Directive and member state prevention service requirements provide a fundamental foundation for providing risk control services to clients in Belgium, and The Netherlands. Industrial hygiene, performance audits, or environmental services are a few examples of external Risk Control services that would meet this regulatory need. Funding for a certified lab could be sought by combining RISC's already successful partnership with the port authority and could be supplemented by offering risk control services to small employers that are not covered by the directives.

The Move Toward Risk Control

Over the past several years, there has been a shift from an "accident" or loss control centered program to one that attempts to look at the underlying risks that create loss-producing conditions. This is not a new concept but one that is not used often. While regulatory based programs are necessary and of benefit if used properly, they may or may not give a clear concise picture to senior management on the financial implications of loss, (Crutchfield, personal communication, October 21, 1999).

Risk control focuses on the broad areas of risk such as product, medical, property, liability, and other risks. It is economically centered by taking loss data and translating it into financial figures which management understands as profit loss with no chance of financial gain. It uses sales levels based on profit margins necessary to recoup losses. When management realizes the financial gain of controlling loss exposures employees will automatically benefit by having a safer workplace.

Service Opportunities: The fundamental goal of Risk Control is the control of risks in order to increase profit and at the same time provide a safe and healthy working environment to employees. By offering a total

Risk Control service package to clients, RISC could gain a significant advantage over regulatory based external prevention service providers.

Industrial Loss Exposures

A loss exposure is any possibility of loss from an accidental or business risk. The potential for financial loss includes property loss, liability loss, personnel loss, and net income loss (Head and Horn, 1997).

A property loss is the reduction of property value due to an accident. Property can be tangible such as a building or equipment (Head and Horn, 1997). In the oil industry, it can be the loss of buildings or equipment due to explosions, fires, or hydrofluoric acid leaks (Bests Loss Control Engineering Guide, 1994). For example, the Philips 66 explosion in 1989 resulted in $1.4 billion in property damage and business interruption costs at the company's Pasadena, Texas, chemical complex (Wilkinson, 1998).

An organization has a liability loss exposure whenever there is a possibility that someone will sue for an alleged wrongdoing, thus requiring the organization to defend itself in a costly legal suit (Head and Horn, 1997). Liability loss exposures in industry can include long-term exposure of the local populace to toxic chemicals by petrochemical producers or storage tank leaks by petroleum refineries (Bests Loss Control Engineering Guide, 1994). In 1976, the Icmesa chemical reactor in

Seveso, Italy exploded releasing a cloud of dioxin causing 2,000 people to be treated for dioxin poisoning. Seveso residents who were exposed to dioxin by the 1976 accident have sued the plant and its owner, the Swiss firm Hoffman-La Roche, but the case has lingered in the Italian civil courts for two decades. The company reportedly paid about $US 1.17 million after the accident for decontamination and property damage, but no one has been compensated for health-related damages (Key, 1997).

Net income loss occurs when there is a reduction in profit due to a reduction in revenue or an increase in expenses due to an accident (Head and Horn, 1997). Net income losses can include any of the loss exposures mentioned earlier as well as product, environmental, and public relation losses. Shell is the most visible example of a company struggling with a loss in market share due to public relation losses. It has responded to the damaging and costly Brent Spar and Nigerian episodes by working hard to project itself as a caring, listening company (Shell, 1999).

A personnel loss occurs when death, disability, retirement, resignation, or layoff deprives the organization of an individual's special skill or knowledge that the organization cannot readily replace. Medical benefits might also have to be paid under these circumstances (Head and Horn, 1997). Personnel loss exposures can include fires, explosions, confined spaces, heavy lifting, or forklifts (Bests

Loss Control Engineering Guide, 1994). In Europe, socialized medicine is the norm. How much does it cost employers? In addition, employers pay disability (loss wages) both temporary and permanent. Do clients know how much? Services may be developed with the use of a Risk Management Information System to determine how much is spent in both medical care and employee disability income.

Engineering Control Technologies

Risk Management Information Systems

Risk Management Information Systems (RMIS) are management systems designed to collect and analyze incurred loss data (including paid losses plus reserves) from insured and self-insured programs. Risk Control professionals can use the data to show management how highly targeted programs can be cost-effective, making it a powerful decision making process (Lowell, 1989). In reality it appears effective RMIS systems can serve as planning tools as well as control tools and be extremely valuable to the decision making process. Regulatory record keeping requirements can also be maintained by an effective RMIS.

Problems are identified from data inputted from past incidents, near hits, and potential loss exposures. The review and selection of controls is influenced by their cost-effectiveness and the results feed back into the decision making process and RMIS components.

Computer storage, organization, classification and report generation allow quick, accurate reporting as well as creative combination of variables to enhance problem solving (Walls, 1996). Companies can purchase off-the-shelf RMIS database software or write their own. The key issue however is the effectiveness of the software to interact between appropriate financial loss data and its conversion into information valuable for risk control decision making at the management level. The benefit of an integrated RMIS is the ability to better protect, conserve and improve organizational assets and resources. It is both a planning and control tool.

Summary of Opportunities: Potential opportunity may be to provide RMIS systems to clients by developing a RMIS system or partnering with an entity that has a system already established. RISC could also examine the potential of partnering with client risk financing units in order to utilize their RMIS system or assist them in making them more process sensitive rather than insurance sensitive. RMIS systems can then be used to determine problem areas for further hazard control engineering.

Hazard Control Engineering

Hazard control engineering is a fundamental element in every risk control system and essential at avoiding personnel and property losses (as well as liability and net income losses). Creating safeguards to protect employees and processes requires the identification of hazards. Hazards can be effectively identified by the use of Job/Process Hazard Analysis (J/PHA) or Process Safety Management (Accident Prevention Manual, 1992).

A J/PHA is a process through which a job or process is defined completely and all of the various steps in a job or process are identified and listed in order. Then each step is analyzed to identify any potential hazards associated with it. The final step involves developing procedures for reducing the hazard potential associated with each respective step (Goetsch, 1993).

The Job/Process Hazard Analysis System provides standard operational procedures, and guides for job performance. It can also be used to familiarize employees and supervisors with job hazard exposures that cause loss and provide a consistent orientation, training and re-training tool for new employees, transfers, and long-term employees (Olson, 1999).

Process Safety Management (PSM) of highly hazardous chemicals is intended to prevent or minimize the consequences of a catastrophic release of toxic, reactive, flammable or explosive chemical from a process. A process is any activity or combination of activities including any use, storage, manufacturing, handling or the on-site movement of highly hazardous chemicals. A process includes any group of vessels, which are located, such that a highly hazardous chemical could be involved in a potential release (OSHA Fact Sheet, 1993). PSM is essentially a J/PHA, which uses extensive hazard recognition systems such as Failure Mode and Effect (FME), Fault Tree Analysis (FTA), What If analysis, and Hazard Operability Analysis (HazOp), see Chapter I for definitions.

Service Opportunities: RISC can provide both training in the use and development of J/PHA systems and provide competent assistance in implementation to its clients. Another service opportunity may be to monitor audit practices as well as provide hazard recognition and control training and retraining. Combining established fire protection (prevention) training with hazard recognition training may be an opportunity to be investigated.

Crude Oil Distillation Process

The Occupational Safety and Health Administration (OSHA Technical Manual, 1999) completed a PSM on petroleum refining processes. The following review of a crude oil distillation process was part of the OSHA PSM.

Description: The first step in the refining process is the separation of crude oil into various fractions or straight-run cuts by distillation in atmospheric and vacuum towers. The main fractions or "cuts" obtained have specific boiling-point ranges and can be classified in order of decreasing volatility into gases, light distillates, middle distillates, gas oils, and residuum.

Atmospheric Distillation Tower. At the refinery, the desalted crude feedstock is preheated using recovered process heat. The feedstock then flows to a direct-fired crude charge heater where it is fed into the vertical distillation column just above the bottom, at pressures slightly above atmospheric and at temperatures ranging from 650° to 700° F (heating crude oil above these temperatures may cause undesirable thermal cracking). All but the heaviest fractions flash into vapor. As the hot vapor rises in the tower, its temperature is reduced. Heavy fuel oil or asphalt residue is taken from the bottom. At successively higher points on the tower, the various major products including lubricating oil, heating oil, kerosene, gasoline, and uncondensed gases (which condense at lower temperatures) are drawn off.

The fractionating tower, a steel cylinder about 120 feet high, contains horizontal steel trays for separating and collecting the liquids. At each tray, vapors from below enter perforations and bubble caps. They permit the vapors to bubble through the liquid on the tray, causing some condensation at the temperature of that tray. An overflow pipe drains the condensed liquids from each tray back to the tray below, where the higher temperature causes re-evaporation. The evaporation, condensing, and scrubbing operation is repeated many times until the desired degree of product purity is reached. Then side streams from certain trays are taken off to obtain the desired fractions. Products ranging from uncondensed fixed gases at the top to heavy fuel oils at the bottom can be taken continuously from a fractionating tower. Steam is often used in towers to lower the vapor pressure and create a partial vacuum. The distillation process separates the major constituents of crude oil into so-called straight-run products. Sometimes crude oil is "topped" by distilling off only the lighter fractions, leaving a heavy residue that is often distilled further under high vacuum.

Vacuum Distillation Tower. In order to further distill the residuum or topped crude from the atmospheric tower at higher temperatures, reduced pressure is required to prevent thermal cracking. The process takes place in one or more vacuum distillation towers. The principles of vacuum distillation resemble those of fractional distillation and, except those larger-diameter columns are used to maintain comparable vapor velocities at the reduced pressures, the equipment is similar. The internal designs of some vacuum towers are different from atmospheric towers in that random packing and demister pads are used instead of trays. A typical first-phase vacuum tower may produce gas oils, lubricating-oil base stocks, and heavy residual for propane deasphalting.

A second-phase tower operating at lower vacuum may distill surplus residuum from the atmospheric tower, which is not used for lube-stock processing, and surplus residuum from the first vacuum tower not used for deasphalting. Vacuum towers are typically used to separate catalytic cracking feedstock from surplus residuum.

Other Distillation Towers (Columns). Within refineries there are numerous other, smaller distillation towers called columns, designed to separate specific and unique products. Columns all work on the same principles as the towers described above. For example, a depropanizer is a small column designed to separate propane and lighter gases from butane and heavier components. Another larger column is used to separate ethyl benzene and xylene. Small "bubble" towers called strippers use steam to remove trace amounts of light products from heavier product streams.

Fire Prevention and Protection. Even though these are closed processes, heaters and exchangers in the atmospheric and vacuum distillation units could provide a source of ignition, and the potential for a fire exists should a leak or release occur.

Safety. An excursion in pressure, temperature, or liquid levels may occur if automatic control devices fail. Control of temperature, pressure, and reflux within operating parameters is needed to prevent thermal cracking within the distillation towers. Relief systems should be provided for overpressure and operations monitored to prevent crude from entering the reformer charge.

The sections of the process susceptible to corrosion include (but may not be limited to) preheat exchanger (HCl and H_2S), preheat furnace and bottoms exchanger (H_2S and sulfur compounds), atmospheric tower and vacuum furnace (H_2S, sulfur compounds, and organic acids), vacuum tower (H_2S and organic acids), and overhead (H_2S, HCl, and water). Where sour crudes are processed, severe corrosion can occur in furnace tubing and in both atmospheric and vacuum towers where metal temperatures exceed 450° F. Wet H_2S also will cause cracks in steel. When processing high-nitrogen crudes, nitrogen oxides can form in the flue gases of furnaces. Nitrogen oxides are corrosive to steel when cooled to low temperatures in the presence of water.

Chemicals are used to control corrosion by hydrochloric acid produced in distillation units. Ammonia may be injected into the overhead stream prior to initial condensation and/or an alkaline solution may be carefully injected into the hot crude-oil feed. If sufficient wash-water is not injected, deposits of ammonium chloride can form and cause serious corrosion. Crude feedstock may contain appreciable amounts of water in suspension which can separate during startup and, along with water remaining in the tower from steam purging, settle in the bottom of the tower. This water can be heated to the boiling point and create an instantaneous vaporization explosion upon contact with the oil in the unit.

Health. Atmospheric and vacuum distillation are closed processes and exposures are expected to be minimal. When sour (high-sulfur) crudes are processed, there is a potential for exposure to hydrogen sulfide in the preheat exchanger, tower flash zone, vacuum furnace, and bottoms exchanger. Hydrogen chloride may be present in the preheat exchanger, tower top zones, and overheads. Wastewater may contain water-soluble sulfides in high concentrations and other water-soluble compounds such as ammonia, chlorides, phenol, mercaptans, etc., depending upon the crude feedstock and the treatment chemicals. Safe work practices and/or the use of appropriate personal protective equipment may be needed for exposures to chemicals and other hazards such as heat and noise, and during sampling, inspection, maintenance, and turnaround activities (OSHA Technical Manual, 1999).

Management Systems

Behavior-based Safety

Behavior-based safety is a management system that defines precisely what behaviors are required from each organizational member; measures whether these behaviors are present; and reinforces desired behavior regularly (Reynolds, 1998). Dan Petterson, (1999) defined Behavior-based safety as:

> A process of involving workers in defining the ways they are most likely to be injured, seeking their involvement and obtaining their buy-in, and asking them to observe co-workers in order to determine progress in the reduction of unsafe behaviors (p. 30).

Behavior based safety programs first identify safe behaviors within a work area. Then, identify or establish forces that encourage safe behaviors, while those that discourage safe behavior are removed. At the same time, predictable positive and negative consequences are developed and implemented to continually reinforce appropriate or expected behaviors or discourage at risk ones.

Behavior-based safety is an example of a system that can be used to reduce accidental losses but should only be used in organizations with corporate cultures that embrace the changes required to implement it. "BBS is no magic pill, no silver bullet. It can be helpful, even useful, in some organizations where it fits, and can be extremely counterproductive in those organizations where it does not fit" (Peterson, 1999).

Essentially, Behavior-based safety outlines expected actions in job performance, provides capabilities to work to those expectations through selection and training. It measures the effectiveness of working to the expectations through assessment of observed actions.

Service Opportunities: In order to provide BBS services client corporate cultures must be able to support such changes (Peterson, 1999). RISC has the service opportunity to make third party evaluations and suggest a management system that would fit best within the organizational structure based on the findings fi¥Á Y ¿ X‹

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y business in order to develop a management system that can be successful in reducing and controlling accidental loss. The key elements represent a proactive management system with a behavioral based approach to achieving a healthy and safe workplace (Fulwiler, 1991). The system has been used and continuously improved as a tool of efficient and effective operation (Olson, 1999).

The key elements from Proctor & Gamble are as follows:

1) Organizational Planning and Support
   a) Expectations and Involvement: The purpose of expectation and involvement refers to expectations shared with everyone and involves all employees in the safety process.
   b) Goal Setting and Action Planning: Relates to a system of planned continuous improvement.
2) Standards and Practices

a) Standard Implementation: Effective implementation of safety and health standards based on company experience, regulatory and voluntary consensus standards

b) Safe Practices: Safe practices are the written site and general departmental safe behavior expectations.

c) Planning for Safe Conditions: Covers systems to engineer, design, purchase, inspect, and maintain the physical work environment.

3) Training

a) Site Training Systems: System that ensures that all individuals are empowered to carry out their expectations for safety and health.

b) Qualification of Health and Safety Resources

4) Accountability (measurement and evaluation) and Performance Feedback

a) Behavior Observation Sampling: System that measures behaviors within the system before they result in injury or illness. They are formal written behavioral audits done randomly with a planned frequency to provide "statistically valid" samples of events within the organization.

b) Behavioral Feedback: Refers to the system to provide individual balanced feedback and to maintain accountability for performance (measured and evaluated).

c) Performance Tracking: Refers to the visible measures of system capabilities and performance (Fulwiler, 1991).

Summary of Opportunities: Both process management, engineering and environmental health and safety/risk control personnel developed the system. Potential use of this system by RISC could be; (1) the design of similar client systems, (2) offer training on the various components to include both management and employees, and (3) develop and conduct audits for the system.

DuPont's Safety Training Observation Program (STOP) System

DuPont's Safety Training Observation Program or STOP is an example of a behavior-based safety program. The objective to the STOP program is to eliminate injuries from individual areas by "skillfully" observing people while they work, focusing on and correcting their at risk behaviors, and reinforcing their safe work practices (behaviors). The system includes all employees and is built on the principle that safety is everyone's responsibility. Management's commitment to safety is clearly communicated. As a result, safety becomes a cohesive element in the work culture, rather than an adversarial one (DuPont, 1999). The key principles of STOP training are:

- Safety is a line management responsibility.
- All injuries and occupational illnesses can be prevented.
- All construction and operating exposures can be reasonably safeguarded.
- Line managers have a responsibility to train all employees to work safely.
- Working safely is a condition of employment.
- Preventing all injuries and incidents is good business (DuPont, 1986).

The STOP system uses Observation Reports that can be completed by any employee to document observed behaviors. The observation form has sections for both safe and unsafe observations. Safe acts observed warrant documentation of the actions taken to encourage continued safe performance. At risk behaviors warrant documentation of the immediate corrective action taken and actions taken to prevent recurrence (Stewart, 1993).

The STOP safety observation checklist is more formal and has specific critical behaviors listed. These include reactions of people, personal protective equipment, positions of people, tools/equipment and procedures/orderliness. This form is used in an audit type situation and specific at risk behaviors are checked (Stewart, 1993).

Summary of Opportunities: RISC could develop an independent audit system designed for individual client cultures and regional climates.

Dow Chemical's Responsible Care

The chemical industry launched its Responsible Care program ten years ago to address growing public concern of chemical production and its human and environmental consequences. Responsible Care is a voluntary initiative within the global chemical industry to safely handle products from inception in the research laboratory, through manufacture and distribution, to ultimate disposal, and to involve the public in Dow's decision-making processes. Born in Canada in 1987, Responsible Care has quickly spread to 45 countries. While Responsible Care goes above and beyond what is legally required in most countries, Responsible Care is a "condition of membership" in chemical industry associations.

Since the inception of the Dow's responsible care initiative environmental impact and accidental losses have been reduced, improving valuable public relations and company assets.

In January 1999, Dow signed on to these more stringent Responsible Care Guiding Principles with other members of the U.S. Chemical Manufacturers Association (CMA). These Principles apply to Dow globally.

> Our industry creates products and services that make life better for people around the world - both today and tomorrow. The benefits of our industry are accompanied by enduring commitments to Responsible Care in the management of chemicals worldwide. We will make continuous progress toward the vision of no accidents, injuries or harm to the environment and will publicly report our global health, safety and environmental performance. We will lead our companies in ethical ways that increasingly benefit society, the economy and the environment while adhering to the following principles:

- To seek and incorporate public input regarding our products and operations.
- To provide chemicals that can be manufactured, transported, used and disposed of safely.

- To make health, safety, the environment and resource conservation critical considerations for all new and existing products and processes.
- To provide information on heath or environmental risks and pursue protective measures for employees, the public and other key stakeholders.
- To work with customers, carriers, suppliers, distributors and contractors to foster the safe use, transport and disposal of chemicals.
- To operate our facilities in a manner that protects the environment, the health and safety of our employees and the public.
- To support education and research on the health, safety and environmental effects of our products and processes to foster the safe use, transport and disposal of chemicals.
- To work with others to resolve problems associated with past handling and disposal practices.
- To lead in the development of responsible laws, regulations and standards that safeguards the community, workplace and environment.

- To practice Responsible Care by encouraging and assisting others to adhere to these principles and practices (William S. Stavropoulos, January 12, 1999).

Summary of Opportunities: The Responsible Care initiative introduces the environmental risk potential of Risk Control. It combines the impact of the European Environmental Management System, and ISO 14000 with the financial implication of public opinion. RISC can develop services aimed at providing third party audit certification for target market clients in the Responsible Care standard as well as assist in implementation through training, engineering, and managerial performance feedback.

Summary

The Framework Directive established the general rules for the protection of the health and safety of workers by employers while national policies in Belgium, and The Netherlands established the regulatory need for risk control services. These requirements set a fundamental foundation for RISC to provide external risk control training, industrial hygiene, auditing, prevention, and environmental services. However, understanding the regulatory need for preventative services in Belgium, and The Netherlands is only a small part of the total risk control package. External prevention service providers can not afford to rely on the need for regulatory-based services alone. Organizations such as RISC should understand the financial implications of loss exposures and the types of control technologies required to control these exposures in their current and potential clients.

In Europe, socialized medicine is the norm. How much does it cost employers? Do clients know how much? Services may be developed with the use of a Risk Management Information System (RMIS). Effective RMIS systems can serve as planning and control tools and they can be extremely valuable to the decision making process. Potential opportunities may be to provide RMIS systems to clients by developing systems or partnering with an entities that have systems already established such as insurance providers, third party administrators or data processing firms. RMIS can then be used to determine heirachical problem areas for further hazard control engineering such as the use of a Job/Process Hazard Analysis (J/PHA).

The J/PHA system provides standard operational procedures, and guides for job performance. It can also be used to familiarize employees and supervisors with job hazard exposures that cause loss and provide a consistent orientation, training and re-training tool for new employees, transfers, and long-term employees (Olson, 1999). RISC can provide both training in the use and development of J/PHA systems and provide competent assistance in implementation to its clients.

Process Safety Management (PSM) is essentially a J/PHA, which uses extensive hazard recognition systems. A service opportunity may be to monitor audit practices as well as train and retrain in hazard recognition and control. Combining RISC's already successful fire protection and prevention training with hazard recognition training may be an opportunity to be investigated.

Proctor & Gamble's Key Elements is an integrated management system designed for continuous improvement through accountability and measurement. Management tools such as Behavior-Based Safety (BBS), and DuPont's Safety Training Observation Program (STOP) system essentially outline expected actions in job performance, provide capabilities to work to those expectations through selection and training. They also measure the effectiveness of working to the expectations through assessment of observed actions. Potential uses of these systems by RISC could be the development of an audit system and the design of similar clients systems designed for individual client cultures and regional climates.

The Responsible Care initiative introduces the risk potential in the environmental and public relations portion of risk control. RISC can develop services aimed at providing third party audit certification for target market clients in the Responsible Care standard as well as assist in implementation through training, engineering, and managerial performance feedback.

Chapter III

METHODOLOGY

Introduction

The purpose of this chapter is to identify the procedures used to conduct this research and develop the basis for determining the risk control needs for RISC's target market clients.

Procedure

Research available information regarding the regulatory need for risk control services in Belgium, and The Netherlands.

Research regulatory directives in the target market.

European Community Directives

Belgium Health and Safety Regulations

Dutch Health and Safety Regulations

Research back issues of European health and safety journals.

International Journal of Health and Safety

International Journal of Health Services

New Solutions

International Journal of Occupational Medicine and Environmental

Health

<u>Research available literature regarding industrial loss exposures as related to RISC's client make up.</u>

Review past and current loss exposure in industry

Best's Loss Control Engineering Manual

Occupational Safety and Health Administration Terminology

Essentials of Risk Management Text

Search company websites

Proctor & Gamble

DuPont

Dow Chemical

<u>Determine available control technologies used in industry.</u>

Review OSHA databases

Review company systems and practices

Proctor and Gamble

DuPont

Dow Chemical

Determine major loss exposures, control technologies, and future risk control expectations in the target market.

Develop interview instrument to be used to solicit information from environmental health & safety/risk control professionals, see Appendix I.

Obtain a list of organizations to participate in the study from RISC's managing director

Conduct personal interviews with environmental health & safety/risk control professionals in the target market.

Interpret data from interviews conducted.

Belgium

The Netherlands

Conclusion

Chapter IV
THE STUDY

Introduction

Chapter four is the analysis of the collected data gathered from six interviews conducted in Belgium, and The Netherlands. The purpose of the study was to determine major loss exposures, control technologies, and future risk control expectations of RISC's target market clients.

Interview questions were developed and presented to selected company health and safety/risk control representatives from June to August, 1999. The following questions were asked and the results are reported below.

1. List the three most severe accidental losses as they relate to cost.
2. What health and safety/risk control technologies are used to control these top three accidental losses?
3. List your top three most frequent accidental losses.
4. What health and safety/risk control technologies are used to control these frequent losses?
5. What are your top three future goals in health in safety/risk control as they relate to the control of accidental losses?

Selected Organizations

Six target market clients in Belgium, and The Netherlands were selected by RISC and asked to participate in the study. The descriptions of the organizations participating in the study are given below.

Belgium:

A chemical production plant employing 120 employees.
A petrochemical plant employing 400 employees.
A petroleum refinery employing 110 employees.

The Netherlands:

1. A petrochemical plant with 230 employees.
2. A Global oil company with more than 10,000 employees.
3. An international shipping company transporting by sea and land with 20,000 employees worldwide and 4,000 employees in The Netherlands.

Data and Results

1. List the three most severe accidental losses as it relates to cost.

1.1. Belgium

1.1.1. Organization #1.

1.1.1.1. Technical losses due to chemical leaks such as HF.

1.1.1.2. Productivity and manpower losses due to human injuries.

1.1.1.3. Environmental losses due to chemical releases.

1.1.2. Organization #2.

1.1.2.1. Fire and explosion losses.

1.1.2.2. Mechanical and technical losses due to human error.

1.1.2.3. Loss time injuries and illnesses.

1.1.3. Organization #3.

1.1.3.1. Production downtime due to technical problems.

1.1.3.2. Environmental losses due to waste water treatment problems.

1.1.3.3. Fire and explosion losses.

1.2. The Netherlands

1.2.1. Organization #1.

1.2.1.1. Production downtime due to project maintenance errors.

1.2.1.2. Environmental releases.

1.2.1.3. Loss time accidents.

1.2.2. Organization #2.

1.2.2.1. Environmental public relation losses.

1.2.2.2. Fire and explosion losses.

1.2.2.3. Operational and technical losses due to human machine interface errors.

1.2.3. Organization #3.

1.2.3.1. Mechanical losses due to inconsistent preventative maintenance.

1.2.3.2. Property losses due to collision damage.

1.2.3.3. Fires

2. What health and safety/risk control technologies are used to control these top three accidental losses?

2.1. Belgium

2.1.1. Organization #1.

2.1.1.1. Process Safety Management (PSM).

2.1.1.2. The use of a three-year training matrix, a risk management information system utilizing early accident and near hit reporting, and a behavior based safety system.

2.1.1.3. The use of PSM, employee empowerment, quality control techniques, and communication of environmental goals and objectives to all levels within the organization.

2.1.2. Organization #2.

2.1.2.1. Fire and explosion prevention and protection treatments such as;

2.1.2.1.1. Sprinkler systems

2.1.2.1.2. Detection systems

2.1.2.1.3. Fire extinguisher equipment

2.1.2.1.4. On the job training (OJT) of employees in the use of the equipment and systems.

2.1.2.1.5. Internal and external fire brigades.

2.1.2.2. Engineering controls such as;

2.1.2.2.1. RMIS

2.1.2.2.2. HazOp teams

2.1.2.2.3. Failure mode and effect (FMEA)

2.1.2.2.4. PSM

2.1.2.2.5. Training in the use of these controls.

2.1.2.3. Engineering and administration controls such as;

2.1.2.3.1. Accident and near hit analysis

2.1.2.3.2. Personal protection equipment (PPE)

2.1.2.3.3. Training in hazard recognition

2.1.3. Organization #3.

2.1.3.1. Engineering and Administration Controls

2.1.3.1.1. Engineering controls

2.1.3.1.1.1. Instrumentation engineering for human interface

2.1.3.1.2. Administrative controls

2.1.3.1.2.1. Operations training

2.1.3.1.2.2. New employee orientations

2.1.3.1.2.3. Monthly emergency response training for operators

2.1.3.2. Bulk reduction in caustic soda and waste treatment improvement.

2.1.3.3. Improved grounding systems and fire response drills.

2.2. <u>The Netherlands</u>

2.2.1. Organization #1

2.2.1.1. RMIS with near hit and accident analysis and the use of a BBS system

2.2.1.2. Job/process hazard analysis (J/PHA)

2.2.1.3. Training

2.2.2. Organization #2

2.2.2.1. Agency management system

2.2.2.1.1. Design internal engineering practices

2.2.2.1.2. Corporate level risk management teams

2.2.2.2. Beginning to end engineering practices

2.2.2.3. Human machine relationship training

2.2.2.3.1. Ergonomics training

2.2.2.3.2. Design engineering courses

2.2.3. Organization#3

2.2.3.1. Preventative maintenance

2.2.3.2. Scenario based simulator training

2.2.3.3. Internal and external fire prevention and protection training.

3. List your top three most frequent accidental losses.

3.1. Belgium:

3.1.1. Organization #1.

3.1.1.1. Productivity due to lack of motivation

3.1.1.2. Burns

3.1.1.3. Trips, slips, and falls.

3.1.2. Organization #2

3.1.2.1. Production losses due to low quality

3.1.2.2. Mechanical and technical losses

3.1.2.3. Injuries and illnesses

3.2. Organization #3

3.2.1. Personal injuries requiring first-aid

3.2.2. Technical losses due to human machine interface

3.2.3. Environmental losses due to the age of the refinery

3.3. The Netherlands

3.3.1. Organization #1

3.3.1.1. Injuries and illnesses

3.3.1.2. Technical based errors

3.3.1.3. Organizational errors

3.3.2. Organization #2

3.3.2.1. Operational and technical errors

3.3.2.2. Fire

3.3.2.3. Environmental losses

3.3.3. Organization #3

3.3.3.1. Mechanical damage

3.3.3.2. Slips, trips and falls

3.3.3.3. Loss of shipment due to the boarding of pirates

4. What health and safety/risk control technologies are used to control these frequent losses?

4.1. Belgium

4.1.1. Organization #1

4.1.1.1. Involving employees in the decision making process and establishing employee responsibilities and accountability.

4.1.1.2. Establishing an on site occupational nurse

4.1.1.3. Engineering design of walking surfaces

4.1.2. Organization #2

4.1.2.1. Quality control

4.1.2.1.1. Quality control through ISO 9000 certification

4.1.2.1.2. Quality control through J/PHA

4.1.2.1.3. In and Out production control/analysis

4.1.2.2. Engineering controls such as;

4.1.2.2.1. RMIS

4.1.2.2.2. HazOp teams

4.1.2.2.3. Failure mode and effect (FMEA)

4.1.2.2.4. PSM

4.1.2.2.5. Training in the use of these controls.

4.1.3. Engineering and administration controls such as;

4.1.3.1. Accident and near hit analysis

4.1.3.2. Personal protection equipment (PPE)

4.1.3.3. Training in hazard recognition

4.1.4. Organization #3

4.1.4.1. RMIS system utilizing accident and first aid reporting and a safety committee with a management and employee membership.

4.1.4.2. Standardized pre-installation plan of equipment and processes

4.1.4.3. Audit systems, preventative maintenance plans, and work requests.

4.2. <u>The Netherlands</u>

4.2.1. Organization #1

4.2.1.1. RMIS with near hit and accident analysis and the use of a BBS system

4.2.1.2. Job/process hazard analysis (J/PHA)

4.2.1.3. Training

4.2.2. Organization #2

4.2.2.1. Human machine relationship training

4.2.2.1.1. Ergonomics training

4.2.2.1.2. Design engineering courses

4.2.3. Beginning to end engineering practices

4.2.4. Agency management system

4.2.4.1. Design internal engineering practices

4.2.4.2. Corporate level risk management teams

4.2.5. Organization #3

4.2.5.1. Preventative maintenance

4.2.5.2. RMIS utilizing individual ship reporting, control decision making and training

4.2.5.3. Illegal boarding precaution training and the instillation of ship perimeter lights.

5. What are your top three future goals in health and safety/risk control as it relates to the control of accidental losses?

5.1. Belgium

5.1.1. Organization #1

5.1.1.1. Establishing an integrated environmental health and safety system

5.1.1.2. Zero accidents and zero emissions.

5.1.1.3. Loss time frequency of one percent

5.1.2. Organization #2

5.1.2.1. Improved prevention advise

5.1.2.2. Develop an integrated risk identification system

5.1.2.3. Implement an RMIS system

5.1.3. Organization #3

5.1.3.1. Training and sensibility

5.1.3.1.1. Safety awareness

5.1.3.1.2. Monthly newsletter

5.1.3.1.3. Toolbox meetings

5.1.3.1.4. Interactive safety training

5.1.3.2. Infrastructure technical improvement

5.1.3.2.1. Engineering controls

5.1.3.2.2. Fall arrest protection above two meters

5.1.3.3. Organizational improvement

5.1.3.3.1. Accident and near hit analysis management and employee teams

5.1.3.3.2. HazOp team development

5.1.3.3.3. Risk analysis utilization from internal and external services

5.2. The Netherlands

5.2.1. Organization #1

5.2.1.1. Near hit analysis with RMIS integration

5.2.1.2. Behavior observation system improvement (BBS)

5.2.1.3. The development of a contractor accident prevention system

5.2.2. Organization #2

5.2.2.1. Improve environmental impact

5.2.2.2. Improve public relations through a reduction of environmental impact

5.2.2.3. None given

5.2.3. Organization #3

5.2.3.1. ISM code documentation implementation

5.2.3.2. ISM awareness training

5.2.3.3. Procedure development

5.2.3.3.1. Ship management

5.2.3.3.2. Voyage planning

5.2.3.3.3. Sea worthiness

5.2.3.3.4. Lower costs related to losses

Discussion

Table I below breaks target market loss exposures down into two categories, severe losses and frequent losses. It then ranks loss exposures into four categories, net income, property, liability, and personnel losses. Net income losses appeared to be the major loss exposures in both severity and frequency. This was primarily due to technical and operational downtime caused by human error. Property damage due to fire and explosion was the second severe loss exposure.

Table II below, breaks the control technologies used to control frequent and severe loss exposures into engineering controls, management controls, management systems, and a combination of management and engineering controls in the target market. The control technologies used to control both severe and frequent losses are similar to those discussed in chapter II. Engineering controls such as process safety management and job/process hazard analysis were mentioned frequently. Fire prevention and protection technologies were also frequently listed. Management controls such as training and RMIS systems were also used frequently.

Table I. Loss exposures* based on severity (cost) and frequency

	Number of Responses	Response Rank	
		Severity	Frequency
Net Income Loss	14	1	1
Property Loss	10	2	3
Personnel Loss	8	3	2
Liability Loss	4	4	4

Note: Definitions of losses can be found in Chapter II.

Table II. Control mechanisms used to control severe and frequent loss exposures.

Controls Used	Number of Responses	Response Ranking	
		Severity	Frequency
Engineering Tools	16	1	2
Management Tools	14	2	1
Management Systems	3	3	3
Combination of Management and Engineering Tools	3	4	4

Table III, ranked future target market expectations in safety and health/risk control. Target market risk control expectations related to the control of major loss exposures tended to center around the development and implementation of management controls designed to incorporate RMIS and training systems. These findings were very interesting considering the second most frequently stated expectation was the reduction in losses. Management system integration was third on the list with engineering control implementation, regulatory compliance, and public relations improvement ranking the same.

Table III, Future Expectations in Safety and Health/Risk Control

Future Expectations	**Number of Responses**	**Response Rank**
Management Control Implementation	7	1
Loss Reduction (net income, property, personnel, and liability)	4	2

Management System Integration	3	3
Engineering Control Implementation	1	4
Regulatory Compliance	1	5
Public Relation Improvement	1	6

Chapter V
Conclusions and Recommendations

Introduction

Restatement of the Problem

The purpose of the study was to determine major loss exposures, control technologies, and future risk control expectations of RISC's target market clients.

The objectives of this study were to: (1) establish a knowledge base of target market loss exposures; (2) identify Risk Control technologies used to control target market loss exposures; and (3) identify target market Risk Control expectations pertaining to the development of control technologies.

Conclusions

Target Market Loss Exposures

The first objective of this study was to establish a knowledge base of target market loss exposures. Net Income losses due to production downtime were the leading loss exposure in the target market. This was primarily due to operational and technical errors. Property losses due to fire and explosion were the second leading loss exposure. Mechanical losses and pirate boarding were also major contributors to property loss for the international shipping company. Personnel losses due to trips, slips, and falls and other injuries were the third leading target market loss exposure. Liability losses primarily due to environmental releases of process chemicals were the fourth leading loss exposure in both target market petroleum and petrochemical companies.

Risk Control Technologies Used

The second objective was to identify Risk Control technologies used to reduce or eliminate target market loss exposures. Those used were similar to those discussed in chapter II. Hazard identification tools such as PSM and J/PHA were mentioned the most, while RMIS systems were listed as the second most frequently used control. Fire prevention and protection technologies were listed third. Interestingly, total management system integration was not used frequently but was used in both target market international companies.

Future Risk Control Expectations

The third goal was to correlate target market Risk Control expectations pertaining to the development of control technologies. The development and implementation of management controls such as a RMIS were the most commonly cited target market future expectations. However, the reduction of overall losses was the second most frequently cited expectations. The implementation of complete management systems designed to control target market loss exposures was the third most cited expectation. While engineering control implementation, regulatory compliance, and public relation improvements tied for the fourth most cited expectations.

Recommendations

Recommendations Related to This Study

1. In order to provide future cost-effective Risk Control services, RISC should develop services such as J/PHA, PSM, and RMIS systems, aimed at the identification of technical and operational errors in target market management systems. This may be accomplished by partnering with engineering groups, insurance carriers, or leaders in safety and health/risk control in industry.
2. To be perceived as a value to target market clients, RISC needs to maintain highly qualified risk control specialists who are capable of providing cost-effective consulting advice. RISC may be better served to recruit and hire professionals directly from industry with technical knowledge of industrial processes.
3. Strengthening RISC's already successful fire protection and prevention training by adding pre-loss hazard recognition training would improve and increase client services as well as provides cost-effective training

for target market clients. Target market risk control services could then be "packaged" for small organization not covered under the regulatory requirement for preventive services.

Recommendation for Further Study

1. In Europe, socialized medicine is the norm, but how much does it cost employers? In addition, do employers know how much they pay in both temporary and permanent disability (lost wages)? Services may be developed with the use of a Risk Management Information System to determine how these cost. Further research is needed in order to determine the financial impact of incurred losses (medical-paid plus reserves and indemnity-paid plus reserves) upon target market clients.

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Appendix I

UNIVERSITY OF WISCONSIN - STOUT/RISC
RESEARCH PROJECT IN RISK CONTROL

The following interview questions ask for information that will be used in a Masters Thesis Paper through the Risk Control program at University of Wisconsin-Stout and will be provided to RISC to help develop future client services. Your participation would be very helpful in the development of future risk control services aimed at controlling industrial loss exposures. The information will be used for research purposes only and will not be used to solicit business from your company.

Consent to participate

I understand that by continuing with this interview, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that no identifiers are needed and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

Signature:____

Note: Questions or concerns about participation in the research or subsequent complaints should be addressed first to David Kraft, Graduate Student, UW-Stout, E5704 490th Ave, Menomonie, WI, 54751, phone 001-715-235-8173. or Dr. John Olson, Professor, UW-Stout, phone 001-715-232-1313 and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI, 54751, phone 001-715-232-1126.

Organizational Information

Companies primary function:

Number of employees:

<u>Accidental Loss Information</u>

List the three most severe accidental losses as it relates to cost?

1.
2.
3.

What health and safety/risk control technologies are used to control these top three accidental losses?

1.
2.
3.

List your top three most frequent accidental losses?

1.
2.
3.

What health and safety/risk control technologies are used to control these frequent losses?

1.
2.
3.

What are your future goals in health and safety/risk control to control above mentioned loss exposures?

1.
2.
3.

If you would like to see the results of this study or would like a copy of my Masters Thesis Paper, please call me at 001 715-232-1313. Thank you for your participation and time.